

officialism ; he is having a hard battle, but there are signs of victory in sight ; the appearance of this translation will add to the discomfiture of his antagonists, when they see that he has secured an influential following in Germany.

The translation is very faithful—rather too much so in parts where misprints and slight errors have not been corrected, as, for instance, in § 189, where an attempt is made to show why alternators tend to synchronism when in parallel ; Prof. Perry should develop the facts more thoroughly, as we know now that the tendency to synchronism exists only under very restricted conditions not always to be secured in practical working.

Dr. Robert Fricke's experience as a professor at a technical high school has had a useful effect of correction on the sublimity of his researches in the exalted regions of modular and automorphic functions, and has led him and his colleague to appreciate a work which most professional mathematicians are too prejudiced to understand.

A. G. GREENHILL.

#### A MUSEUM CATALOGUE.

*Descriptive and Illustrated Catalogue of the Physiological Series of the Museum of the Royal College of Surgeons, London.* Vol. ii. Pp. ix + 518. Second edition. (London : Taylor and Francis, 1902.)

IT is now more than two years since we reviewed the first volume of this series (*NATURE*, vol. lxii. p. 385), and to the present one, the second, we are disposed to extend even greater praise than to the first. The book has thrice the bulk of its predecessor, and it is wholly concerned with the descriptions of the nervous system of certain Invertebrates, and the brain and spinal cord, with their membranes and blood-vessels, of Vertebrates. Its main portion is the work of Prof. Elliot Smith, of Cairo, now our foremost authority on the Vertebrate brain ; and in it he describes the brains of the Reptilia and Mammalia in a manner never before attained. He was induced to undertake the task by Prof. C. Stewart, the curator of the museum, at the time at which, in the ordinary course of work, the unparalleled series of mammalian brains which the College possesses were being remounted. Ripe for the opportunity of handling this material, Dr. Elliot Smith has given us, not a mere catalogue, but a masterly treatise teeming with revisionary and new observations, which make for orderly treatment and simplification in a manner surpassing those of most previous essays of the kind.

Some notion of his methods and results may be formed from a brief *résumé* of his work on the "pallium" and "Sylvian fissure," two of the most important things of which he treats. In dealing with the former, he applies to the pyriform lobe and the hippocampus the terms "basal" and "marginal" pallium, in order sufficiently to emphasise, for the first time, the fact that the intervening area or "neopallium," the most variable, is both morphologically and physiologically the most important pallial constituent, and that in the study of this, which he defines as "the organ of associative memory," lies the clue to the chief determination of the real nature of at least the

cerebrum of the leading mammalian types.<sup>1</sup> As to the "Sylvian fissure," we meet with an ever-recurring treatment of it throughout the book ; and in establishing the fact that the cortical areas from which its lips are formed are non-homologous in different mammals, the author shows that by failure to appreciate this in the past an inextricable confusion has arisen. Concluding that the Sylvian fissure proper is in its complete form found only in the human brain, and proving that it results from the meeting of three sulci phylogenetically distinct and variable in extent and interrelationship among the lower forms, introducing a rational terminology, he has systematised this complex subject on entirely new lines ; and it is worthy of remark that he of necessity once more establishes a distinction between the pallial surface of man and the higher apes.

This much is simply revolutionary, but it is characteristic of the whole book ; and when it is seen that the brains of representative members of every family have come under review, that in the case of many extinct forms casts of the brain-cavity have been studied, that there are 220 new illustrations, in themselves as accurate as the text, and that an all-sufficient bibliography is given, the result is one upon which all concerned are to be heartily congratulated.

The book forms the framework of an arch, of which the parts necessary for its completion have been obtained by the study, in Cairo and elsewhere, of such material as was originally lacking. There will shortly appear in the *Transactions* of the Linnean Society two memoirs directly related to this catalogue, which, as read, give promise of results at least equal to those of the author's great achievements with the Edentata, the Monotremes and Marsupialia, now everywhere recognised as of prime importance and in the highest degree luminous. Whenever possible, series of brains of each individual species have been studied, and memoirs and catalogue combined will furnish the finest contribution of the last quarter of a century to the science of cerebral topography and the analysis of the commissural systems of the brain.

The minor portion of the catalogue is contributed by Mr. R. H. Burne, the assistant to the curator, and is based on anatomical preparations fully equal to those through which he has obtained distinction in the building up of the collections. The Echinodermata, Annelida, Arthropoda and Mollusca, with the Protochordata, Cyclostomi, Pisces, Amphibia and Birds, have fallen to his lot ; and he is responsible for the concluding sections on the membranes, blood-vessels, and spinal cord. Accuracy of detail is the distinctive feature of all that he has put on record, and he has introduced a novel method of display. He gives us new and welcome drawings of microscopic sections of the ganglia of not a few invertebrate forms and of the teleostean pallium, with a bibliography sufficient for the first needs of those who may desire further information. He has played a good second to his distinguished co-author, and a magnificent volume has been produced, worthy the best associations of the great institution whence it originates, the

<sup>1</sup> Pp. 465-466, in which the author elaborates this theme, are fascinating reading.

enthusiasm and foresight of its curator, and the cost of its production, which must have been heavy, and which its council have so liberally borne. Inseparable from the great collections it elucidates, this book should attract workers to them. It furnishes the basis from which all future research on the morphology of the mammalian cerebrum that shall be exact must take its start.

### LIGHT FOR STUDENTS.

*Light for Students.* By Edwin Edser, A.R.C.Sc., &c. Pp. viii + 579. (London: Macmillan and Co., Ltd., 1902.) Price 6s.

THIS book is intended to meet the wants of the same class of students as the author's "Heat for Advanced Students," published three years ago. It gives a comprehensive account of the phenomena and laws of geometrical and physical optics, with a number of simple, illustrative experiments and examination questions. Special pains have been taken throughout, as in the author's "Heat," to make all the explanations as simple as possible, so that the private student, who has not the advantage of a teacher's assistance in explaining his difficulties, should find the book particularly helpful. Advanced mathematical methods have been scrupulously avoided, and the calculus is rigidly excluded. This necessarily limits the scope of the work, but the author has found it possible to give a very good general idea of the more difficult parts of the subject and of comparatively advanced theories, such as Sellmeier's theory of dispersion, without making any extravagant demands on the mathematical knowledge of the student.

The first ten chapters are devoted to geometrical optics, the last ten to the development of the wave theory of light. A brief summary is given of the properties of thick lenses, as introducing an account of the eye and of vision through lenses and spectacles. In the chapter on optical instruments, the construction of eye-pieces is dealt with at unusual length, but on the other hand, the account of telescopes is somewhat scanty. Little or nothing is said about the conditions affecting the brightness of the image or the extent of the field of view. The ray diagrams are drawn, following the prevailing custom, without indicating the correct position of the eye. The diagram of Galileo's telescope shows a pencil of rays full and central on the object-glass, and small and excentric on the eye-lens. This is the common practice in text-books, but it does not correctly represent the conditions of vision through this instrument.

The following experiment is given as a proof that the spherical aberration of the eye is over-corrected:—

"Expt. 35.—Close one eye, and place the other at a distance of less than ten inches from a printed page, so that the type cannot be clearly seen. Then place a pinhole immediately in front of the pupil. The printing will become clearly visible, although rendered fainter owing to the loss of light."

Simple experiments of this kind are very helpful to the student, but in this particular instance the con-

clusion is hardly justifiable. The pinhole would also make the print clearer if held near the margin of the pupil or if the print were beyond the distance of distinct vision of a short-sighted eye. The experiment would be more appropriate as an illustration of increased depth of focus produced by stopping down a lens. An adequate test of the spherical aberration of the eye is not quite so simple.

The wave theory of light is introduced by a chapter on vibrations and waves in general, including an elementary account of the propagation of transverse waves in an elastic solid. This is followed by a general explanation of the rectilinear propagation of light, and of the reflection and refraction of waves. The chapter on the spectrum contains many illustrations from astronomy, such as the proof of the nature of Saturn's rings derived from the Doppler effect. But no account is given of theories of colour vision or of experimental methods of investigation. The chapters on interference, diffraction and polarisation contain photographic illustrations by Mr. W. B. Croft and others of fundamental phenomena. Some account is also given of recent instruments and experiments, such as the echelon grating and Rubens's experiments on infra-red rays of great wave-length. Limits of space have prevented the author from giving an account of the electromagnetic theory of light. The advisability of this would also have been questionable on other grounds. The book, considering its size, already contains an unusually large amount of information, and more could not reasonably be expected by the class of student for whom it is written.

H. L. C.

### OUR BOOK SHELF.

*Mr. Balfour's Apologetics Critically Examined.* Pp. vi + 232. (London: Watts and Co., 1902.) Price 3s. 6d.

THIS book, issued anonymously by the Rationalist Press Association, is explicitly directed against Mr. Balfour's defence of Christianity (p. 10). To those who read with an animus against this "decaying creed," the author's vigour and lavish use of epithets may appear conclusive reasoning. To the impartial, it will scarcely appear to be criticism at all. Mr. Balfour's method in the "Foundations of Belief" was to advance from the more general philosophic position to the problem of "Provisional Unification." However much his critic believed that Mr. Balfour's theism was based on "emotion and sentiment" (p. 222), or that it could be explained by a review of his pedigree (p. 224), he had no right to rely too much on this application of the historical method.

At least, one expects to find that the "frontal attack" which the author prefers to Mr. Balfour's "sap and mine" (p. 222) shall be directed against the real stronghold. Yet, so far as this book goes, the author leaves untouched the questions, Has experience any elements which cannot be treated as we treat knowledge of "things"? If so, do these elements constitute data from which we may infer that "the whole circuit of belief" has wider foundations than "science" as such requires? And lastly, if the foundations are thus widened, do they admit Theism or Christianity as a form of it? It is easy to call the Incarnation a manifest absurdity; what is